Historical Trends in Niagara's ICT Sector, 2001 to 2022

Definitions & Research Method

Information and communications technology (ICT) is a broad range of industries comprising technologies related to communications media (including wireless signals) and computers, including software, apps, digital platforms, data storage, management and dissemination, and audiovisual systems. ICT gadgets, conduits and platforms include "the Internet, wireless networks, cell phones, and other communication mediums." These technologies and their related systems together support the access, storage, transmission and management of information and devices. This means that a region's ICT capacity reflects its ability to build the critical physical, digital and human infrastructure to support a wide spectrum of activities across all sectors in a knowledge-driven economy.

As the name implies, the ICT sector includes establishments primarily engaged in producing and distributing information and communications products. The sector in a narrow sense is typically associated with computing infrastructure providers, data processing, web hosting, and related services industries.[1]

In light of the above, for this research we define the ICT sector as a composite of industrial activities as defined by Statistics Canada's North American Industry Classification System (NAICS):
- Computer and peripheral equipment manufacturing
- Communications equipment manufacturing
- Audio and video equipment manufacturing
- Navigational, measuring, medical and control instruments manufacturing
- Computer and communications equipment and supplies merchant wholesalers
- Software publishers
- Wired and wireless telecommunications carriers (except satellite)
- Satellite telecommunications
- Other telecommunications
- Data processing, hosting, and related services
- Computer systems design and related services
- Electronic and precision equipment repair and maintenance

For purposes of data analysis, we focus on a set of industries and occupations listed under the four-digit NAICS and National Occupation Classification (NOC) codes, respectively. The data was sourced from Lightcast's Labor Market Analytics and consists of two distinct sets of data that serve as prisms for analyzing trends in ICT, namely, jobs by industry and jobs by occupation. While the distribution of jobs by industry (represented in NAICS codes) gives us a good picture of current trends across Niagara's ICT sector, another lens through which we can view such trends is the distribution of jobs by occupation (represented in NOC codes).

The importance of this "occupation" lens is that it sheds light on the human and talent dimensions of the ICT sector, supplying insights into the nature of skillsets or expertise required. NOC codes can help track changes in the types of jobs needed within a sector or industry that NAICS cannot. They supply a framework to understand the composition, skill requirements, labour market trends, and other characteristics of economic sectors. The NOC codes facilitate the identification of emerging job sectors and the decline of traditional occupations. This information in turn allows us to make inferences about the region's existing talent pool, its implications for innovation, adaptability and resilience of the ICT sector, and allows for effective policy responses.

The data cover a 20-year period (2001 to 2022) and consist of absolute and percentage changes over time. This paper also includes the national location quotients for each of the industries. We included the location quotients because they indicate an area's level of specialization in each industry. Specifically in this case it allows us to compare a region's job concentration in its ICT sector relative to total jobs concentration in Ontario and Canada's ICT sector. An LQ of 1.5 or higher shows a high degree of specialization.

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[1] *Statistics Canada. 2022. North American Industry Classification System (NAICS) Canada 2022 Version 1.0. https://bit.ly/3s2lByH*

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The data focuses on Niagara.[2] However, for comparative reasons, it also includes provincial and national figures and trends for the same period as well as data from a select number of Census Metropolitan Areas (CMA) within Ontario that have sizeable ICT sectors. We chose midsized regions as comparators because in addition to their demographic characteristic as midsized CMAs, they have identified the sector in their economic development strategies as one of their lead economic drivers; have natural endowments favorable to the sector; have built facilities to leverage the potentials of the sector; and have undertaken active promotional activities as part of their economic development strategies.

SECTION 1: CHANGES IN NIAGARA'S ICT SECTOR, RELATIVE TO ONTARIO AND CANADA

In this section, we examine changes in Niagara's ICT sector, comparing trends in the region with those of Ontario and Canada as a whole. The analysis covers both NAICS and NOC data, examining changes in jobs by industry and occupation. The discussion begins with NAICS data on industry trends and then proceeds to the NOC data on changes in occupation.

Table 1 shows the changes in ICT sector jobs between 2001 and 2022, comparing Niagara with provincial (Ontario) and national trends. As Table 1 and Figure 1 show, Niagara has seen a massive spike of 112 per cent over the past two decades, far better than the provincial and national growth rates of 37 per cent and 42 per cent, respectively.

Table 1: Change in ICT jobs, 2001–2022; Niagara, Ontario and Canada compared

Regions	2001 Jobs	2022 Jobs	Change	Percentage Change
St. Catharines—Niagara	1,667	3,543	1,875	112%
Ontario	261,273	357,543	96,270	37%
Canada	539,107	768,047	228,940	42%

As Figure 1a illustrates, while the growth trajectory for Ontario and Canada closely mirrors each other by showing a steady increase over the past 20 years, Niagara reports a more varied rate of change since 2011 with a dramatic upswing that outpaces the provincial and national rates of growth. Niagara's trend could be a microcosm of midsized regions catching up with larger urban centres in Canada. Furthermore, the sector is projected to continue its upward trend over the next five years.

**Figure 1a:** Industry job growth in ICT, 2001–2022; Niagara, Ontario and Canada compared
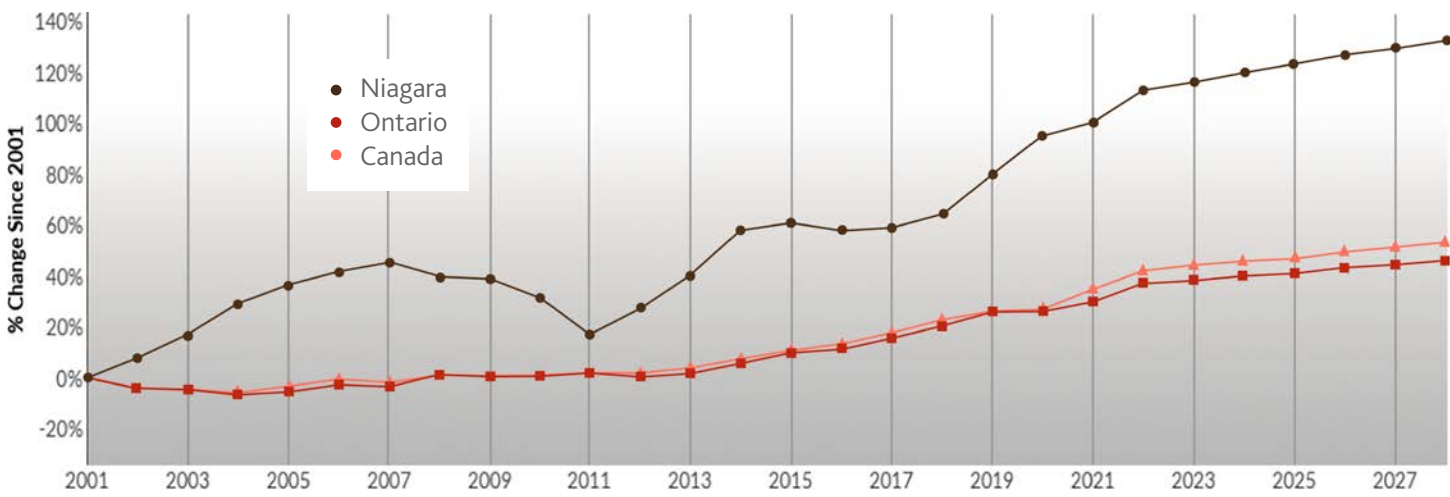
[2] It is important to note that for this study, we used the geographical area of the St. Catharines—Niagara CMA, which does not include Grimsby and West Lincoln. This was necessary to be able to compare the local ICT sector to other CMAs (the geographic unit of economic analysis) in Ontario.

To shed light on more recent trends in the sector, Figure 1b shows the changes in ICT jobs over the past decade (between 2011 and 2022), comparing Niagara with trends in Ontario and Canada. Niagara, along with the province and the country, report growth, with Niagara's growth of 97.8 per cent still outpacing the national and provincial rates.

Table 2 summarizes percentage growth between 2001 and 2022 in ICT jobs by industry. Niagara's increase in ICT jobs outpaces the provincial and national growth rates in three industries, namely: "Computer systems design and related services" (237 per cent), "Computer and peripheral equipment manufacturing" (201 per cent), and "Electronic and precision equipment repair and maintenance" (104 per cent). The region also boasts respective job increases in "Data processing, hosting, and related services" (76 per cent), "Computer and communications equipment and supplies merchant wholesalers" (66 per cent), and "Software publishers" (63 per cent).

As Figure 2 illustrates, Niagara registered decline in only two industries: "Wired and wireless telecommunications carriers (except satellite)" (-17 per cent) and "Other telecommunications" (-67 per cent).

Figure 1b: Industry job growth in ICT, 2011–2022; Niagara, Ontario and Canada compared
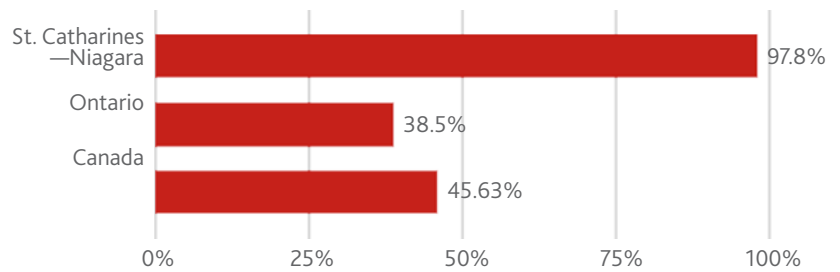
Figure 2: Niagara's percentage growth of ICT jobs, 2001–2022*
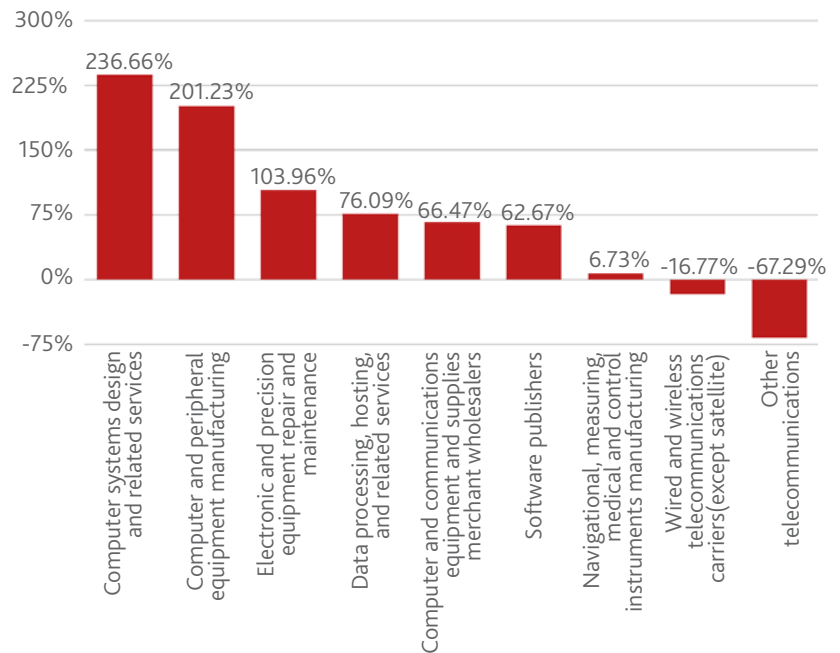
Table 2: Percentage change in ICT jobs by industry, 2001–2022; Niagara, Ontario, and Canada compared*

Industry	Niagara	Ontario	Canada
Computer systems design and related services	237%	98%	106%
Computer and peripheral equipment manufacturing	201%	(75%)	(72%)
Electronic and precision equipment repair and maintenance	104%	11%	(10%)
Data processing, hosting, and related services	76%	152%	123%
Computer and communications equipment and supplies merchant wholesalers	66%	9%	(5%)
Software publishers	63%	189%	151%
Navigational, measuring, medical and control instruments manufacturing	7%	(27%)	(15%)
Communications equipment manufacturing	NSD	(65%)	(63%)
Audio and video equipment manufacturing	NSD	(49%)	(27%)
Wired and wireless telecommunications carriers (except satellite)	(17%)	(42%)	(9%)
Other telecommunications	(67%)	(7%)	0%

*NSD=Not Sufficient Data. For industries/occupations where the job counts are close to zero, the generated tables tend to report 'Not Sufficient Data'. In such instances where this occurs across the board, the industry or occupation in question is removed from the analysis.

Competitiveness (Location Quotient Scores)

Another lens through which we can understand changes in Niagara ICT is the location quotients (LQs) of jobs in the respective industries that make up the sector. The LQ scores indicate an area's level of specialization in industries, with a score above 1.5 indicating a significant degree of specialization compared to other regions in the country.

As Table 3 indicates, Niagara reported modest increases in competencies in several industries but demonstrated a respectable competitive advantage above the national average in only one industry, "Audio and video equipment manufacturing" where it shifted from a nonexistent locational quotient of 0 in 2001 to a score of 2.12 in 2022.

Table 3: Niagara's national location quotient for ICT jobs by industry, 2001 vs. 2022

Industry	2001	2022
Audio and video equipment manufacturing	0.00	2.12
Communications equipment manufacturing	0.00	0.37
Computer and communications equipment and supplies merchant wholesalers	0.12	0.25
Computer and peripheral equipment manufacturing	0.07	0.92
Computer systems design and related services	0.27	0.54
Data processing, hosting, and related services	0.56	0.53
Electronic and precision equipment repair and maintenance	0.31	0.85
Navigational, measuring, medical and control instruments manufacturing	0.32	0.48
Other telecommunications	0.66	0.26
Satellite telecommunications	0.19	0.00
Software publishers	0.64	0.50
Wired and wireless telecommunications carriers (except satellite)	0.21	0.24

Figure 3 illustrates Niagara's national location quotient for ICT jobs in 2022, sorting them by highest to lowest. "Audio and video equipment manufacturing"; "Computer and peripheral equipment manufacturing"; "Electronic and precision equipment repair and maintenance'; "Computer systems design and related services"; "Data processing, hosting, and related services"; and "Software publishers" are the most competitive industries in the region's ICT sector in 2022. However, "Audio and video equipment manufacturing" is the only industry in which Niagara's competitiveness surpasses the national average.

Figure 3: Niagara's national location quotient for ICT jobs, 2022 (sorted by highest to lowest)
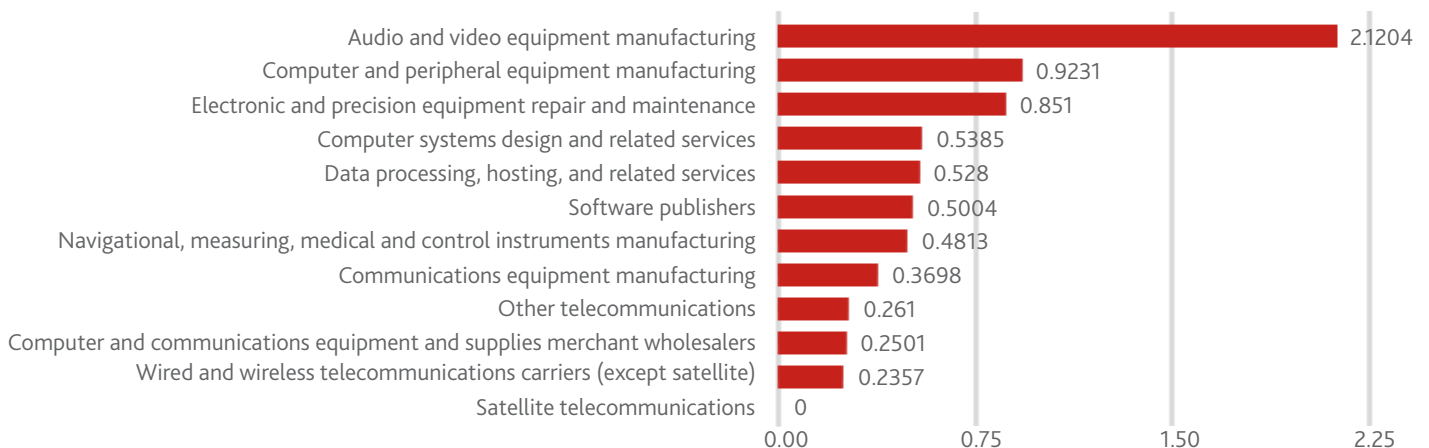
It is important to set Niagara's low LQ scores against the seemingly paradoxical backdrop of high percentage growth in key ICT industries relative to the provincial and national growth rates. A simple explanation is that smaller regions like Niagara were simply not present on Canada's ICT map two decades ago. Thus, even after massive spikes in growth rates in key industries, they are still far below their counterparts in larger urban centres. For instance, Ontario's ICT sector is still concentrated in regions like Kitchener-Waterloo, Toronto and Ottawa.

As Table 4 reveals, compared to Ontario's LQ scores, apart from the "Audio and video equipment manufacturing" industry, Niagara trails the provincial scores in all other industries and reports no other LQ score above 1.

Occupations in ICT

As noted earlier, while the distribution of jobs by industry gives us a good picture of current trends in Niagara's ICT sector, another lens through which we can view such trends is the distribution of jobs by occupation. The importance of this lens is that it sheds light on the human and talent dimensions of the ICT sector, supplying insights into the nature of skillsets or ability needed. This information in turn allows us to make inferences about the region's existing talent pool and its implications for innovation, adaptability and resilience of the sector.

Table 5 shows Niagara's top ICT occupations, comparing those in 2001 with those in 2022. "Computer programmers and interactive media developers" and "Information systems analysts and consultants" have maintained their dominance of the sector over the past two decades and, more importantly, experienced job increases over the same period.

In fact, the configuration of the top five industries remains the same except that "Web designers and developers" have overtaken "Electronic service technicians (household and business equipment)".

Table 4: Niagara's national location quotient for ICT Jobs, 2022, compared with Ontario

Industry	Niagara	Ontario
Audio and video equipment manufacturing	2.12	1.32
Computer and peripheral equipment manufacturing	0.92	1.64
Electronic and precision equipment repair and maintenance	0.85	1.23
Computer systems design and related services	0.54	1.21
Data processing, hosting, and related services	0.53	1.58
Software publishers	0.50	1.34
Navigational, measuring, medical and control instruments manufacturing	0.48	1.13
Communications equipment manufacturing	0.37	1.29
Other telecommunications	0.26	1.25
Computer and communications equipment and supplies merchant wholesalers	0.25	1.64
Wired and wireless telecommunications carriers (except satellite)	0.25	0.65
Satellite telecommunications	0.00	1.44

Table 5: Niagara's top ICT occupations by job numbers, 2001 to 2022

Occupations	2001
Computer programmers and interactive media developers	253
Information systems analysts and consultants	159
Technical sales specialists—wholesale trade	149
Electronic service technicians (household and business equipment)	99
Web designers and developers	86
Occupations	**2022**
Computer programmers and interactive media developers	485
Information systems analysts and consultants	485
Technical sales specialists—wholesale trade	245
Web designers and developers	173
Electronic service technicians (household and business equipment)	148

Table 6 compares the percentage growth in top ICT occupations between 2001 and 2022. Niagara's top ICT occupations outperform the provincial and national growth rates in "Information systems analysts and consultants" (204 per cent as compared to 116 per cent for Ontario and 100 per cent for Canada), "Web designers and developers" (100 per cent compared to 28 per cent and 90 per cent), and "Computer programmers and interactive media developers" (92 per cent as compared to 66 per cent and 87 per cent). In "Technical sales specialists—wholesale trade", Niagara's increase of 65 per cent is set against provincial and national declines of 10 per cent and 12 per cent, respectively, and "Electronic service technicians (household and business equipment)" saw a Niagara increase of 49 per cent while Ontario decreased 40 per cent and Canada 38 per cent.

Table 6: Niagara's top ICT occupations, percentage change in jobs, 2001–2022; Niagara, Ontario and Canada compared

Top Occupations	Niagara	Ontario	Canada
Information systems analysts and consultants	204%	116%	100%
Web designers and developers	100%	28%	90%
Computer programmers and interactive media developers	92%	66%	87%
Technical sales specialists—wholesale trade	65%	(10%)	(12%)
Electronic service technicians (household and business equipment)	49%	(40%)	(38%)

SECTION 2: CHANGES IN ICT, NIAGARA AND OTHER ONTARIO MIDSIZED REGIONS COMPARED

In this section, we examine changes in Niagara's ICT sector, comparing trends in the region with those in a select number of midsized regions. These regions were selected due their relative strength in the ICT sector as well as their demographic similarity to Niagara, a midsized region. For simplicity, the analysis focuses on NAICS data, examining changes in jobs by industry.

In Table 7, we see a summary of growth in the ICT sector, comparing trends in Niagara with those of other Ontario midsize regions. All the regions registered an overall positive growth in ICT jobs, but Niagara tops the list with 112 per cent compared to Hamilton's 78 per cent, Windsor's 27 per cent, London's 28 per cent and Sudbury's 16 per cent.

Table 7: Change in ICT jobs, 2001–2022; Niagara and other Ontario regions compared

Region	2001 Jobs	2022 Jobs	Change	% Change
St. Catharines—Niagara	1,667	3,543	1,875	112%
Hamilton	6,879	12,266	5,388	78%
Windsor	2,121	2,693	572	27%
London	6,486	8,303	1,818	28%
Greater Sudbury	982	1,143	162	16%

Figure 4: Change in ICT Jobs, 2001–2022; Niagara and other Ontario regions compared
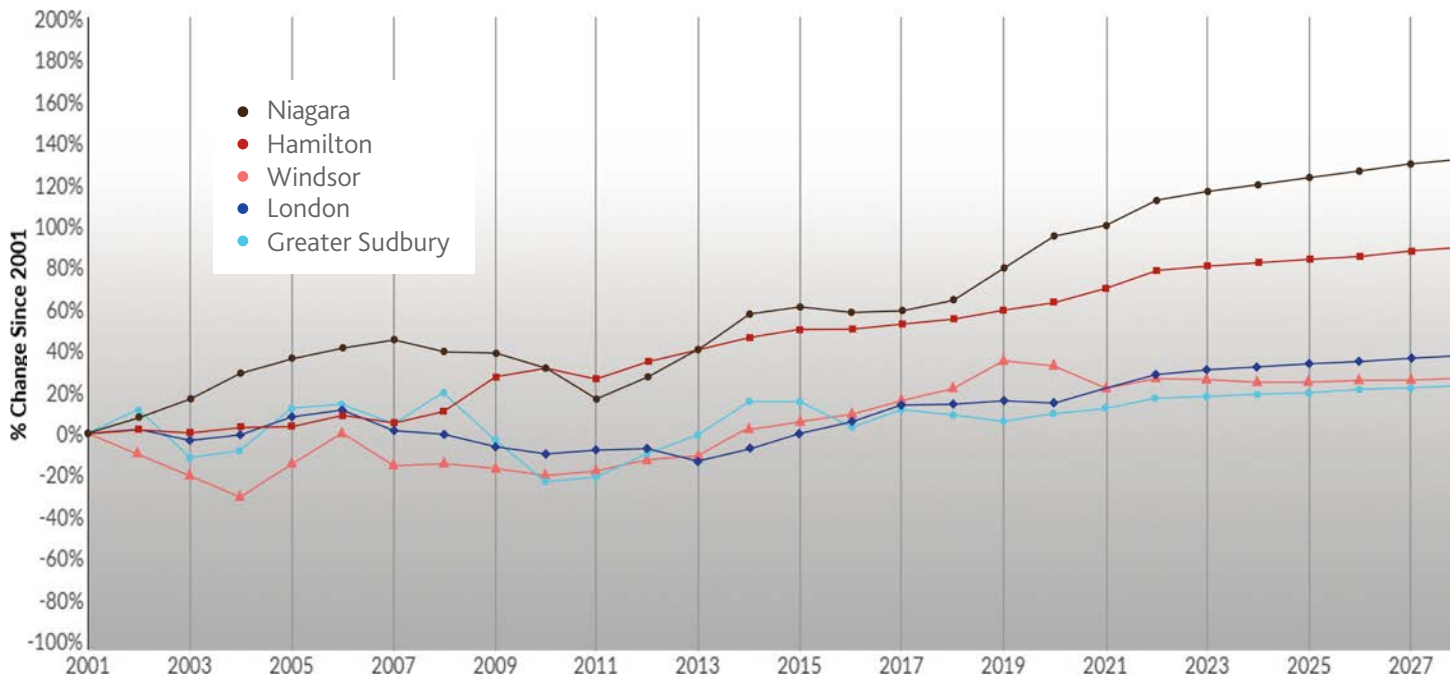

Table 8 provides a breakdown of percentage changes between 2001 and 2022 in ICT jobs by industry, comparing Niagara with similar midsize regions in Ontario. Niagara presents a relatively healthy jobs growth trend across several industries in the ICT sector, leading its peer regions in "Computer systems design and related services" (237 per cent), "Computer and peripheral equipment manufacturing" (201 per cent), and "Electronic and precision equipment repair and maintenance" (104 per cent). These industries point to Niagara's competitive advantage relative to other regions and worthy of note as areas of promising strengths and potential assets as the region continues its journey of increasing digitization.

Table 8: Percentage change in ICT jobs by industry, 2001–2022; Niagara and other Ontario regions compared

Industry	Niagara	Hamilton	Windsor	London	Sudbury
Computer systems design and related services	237%	135%	66%	91%	178%
Computer and peripheral equipment manufacturing	201%	(82%)	NSD	(47%)	(57%)
Electronic and precision equipment repair and maintenance	104%	2%	25%	93%	(41%)
Data processing, hosting, and related services	76%	377%	NSD	199%	NSD
Computer and communications equipment and supplies merchant wholesalers	66%	111%	24%	51%	(18%)
Software publishers	63%	225%	101%	373%	86%
Navigational, measuring, medical and control instruments manufacturing	7%	47%	(27%)	(53%)	(35%)
Communications equipment manufacturing	NSD	1245%	(15%)	NSD	34%
Audio and video equipment manufacturing	NSD	61%	(100%)	NSD	0%
Wired and wireless telecommunications carriers (except satellite)	(17%)	(40%)	(15%)	(66%)	(67%)
Other telecommunications	(67%)	(29%)	32%	(36%)	116%
Satellite telecommunications	NSD	(34%)	NSD	NSD	NSD

*NSD=Not Sufficient Data

Competitiveness (Location Quotient Scores)

For an even clearer picture of how Niagara is faring in each of these ICT industries compared to other regions in Ontario, we juxtapose Niagara's LQ scores with the same midsize regions. Table 9 provides the LQ scores of these regions. Niagara reported a high LQ score of 2.12 only in "Audio and video equipment manufacturing".

What the table also offers is a panoramic portrait that highlights the relative weakness of Ontario's midsized regions in the ICT sector. Other than isolated pockets of one or two industry strengths in the ICT sector, most industries are below the benchmark national average LQ score of 1. Once again, these figures point to the concentration of the digital sector in the province's three main centres—Kitchener-Waterloo, Toronto and Ottawa.

Table 9: ICT national location quotient by industry, 2022; Niagara and other Ontario regions compared

Industry	Niagara	Hamilton	Windsor	London	Sudbury
Audio and video equipment manufacturing	2.12	0.82	0.00	0.00	0.00
Computer and peripheral equipment manufacturing	0.92	0.98	0.20	0.84	0.57
Electronic and precision equipment repair and maintenance	0.85	1.01	1.09	1.25	0.56
Computer systems design and related services	0.54	0.75	0.38	0.74	0.28
Data processing, hosting, and related services	0.53	0.44	0.10	0.77	0.01
Software publishers	0.50	0.84	0.26	1.26	0.34
Navigational, measuring, medical and control instruments manufacturing	0.48	1.05	1.09	0.92	0.22
Communications equipment manufacturing	0.37	5.61	0.18	0.02	0.41
Other telecommunications	0.26	0.65	0.88	0.83	1.78
Computer and communications equipment and supplies merchant wholesalers	0.25	0.82	0.63	1.00	0.19
Wired and wireless telecommunications carriers (except satellite)	0.24	0.49	0.35	0.39	0.29
Satellite telecommunications	0.00	0.62	0.00	0.35	0.00

Wages

Another lens for examining the comparative vitality of Niagara's ICT sector is the wage distribution of the sector relative to those of similar regions. As indicated in Figure 5, Niagara reported a median income of $67,917—placing it right in the middle of the pack.

Figure 5: ICT median annual income, Niagara and other Ontario regions compared

Hamilton	London	St. Catharines—Niagara	Greater Sudbury	Windsor
$82,787.79	$72,114.29	$67,917.68	$67,607.17	$64,742.16